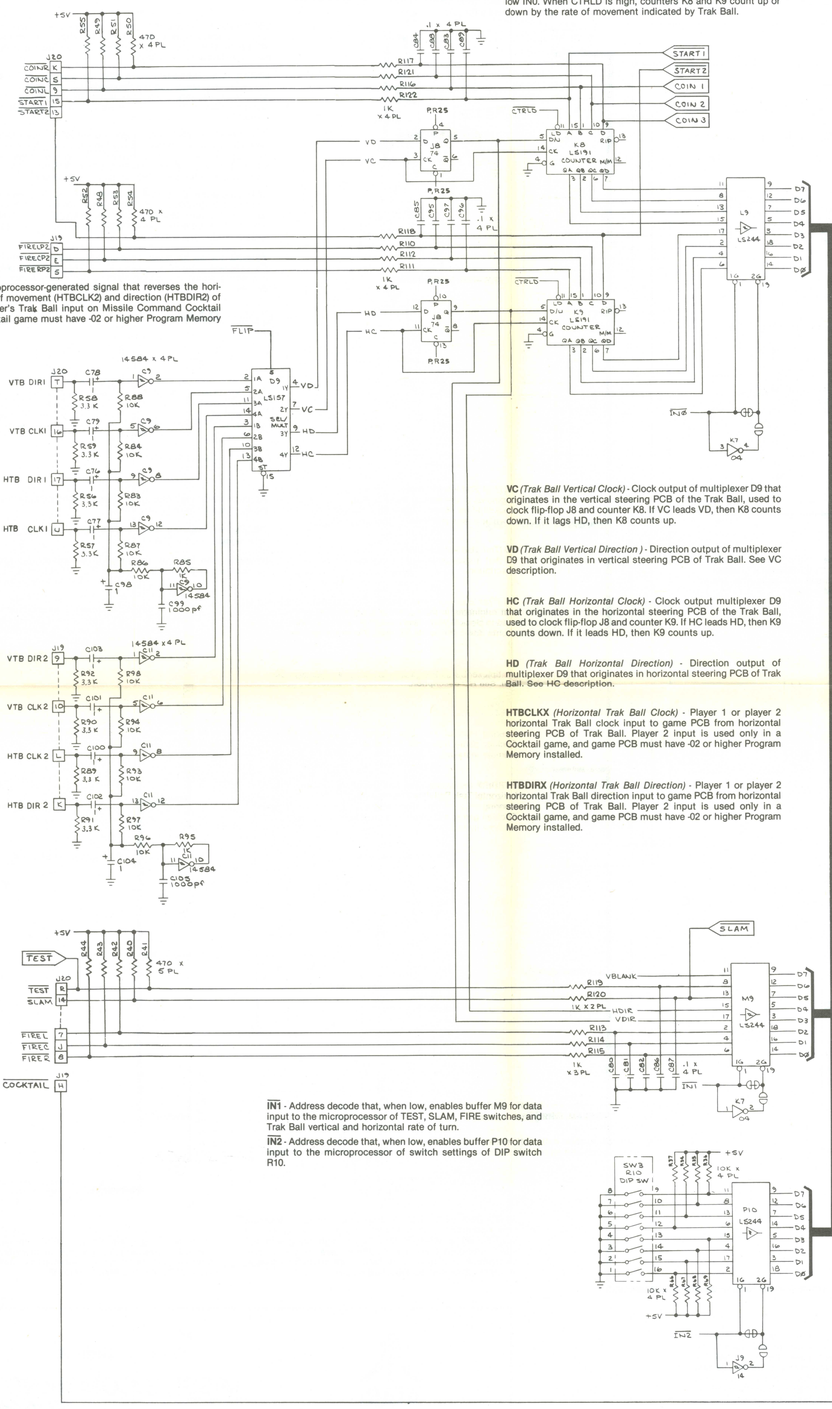
# Input Circuits




**CTRLD** *(Counter load enable)* - Latched microprocessor output that, when low, permits microprocessor to read switch data through counters K8 and K9 when data buffer L9 is enabled with low IN0. When CTRLD is high, counters K8 and K9 count up or down by the rate of movement indicated by Trak Ball.

**FLIP** - Microprocessor-generated signal that reverses the horizontal rate of movement (HTBCLK2) and direction (HTBDIR2) of second player's Trak Ball input on Missile Command Cocktail game. Cocktail game must have -02 or higher Program Memory installed.

**VC** *(Trak Ball Vertical Clock)* - Clock output of multiplexer D9 that originates in the vertical steering PCB of the Trak Ball, used to clock flip-flop J8 and counter K8. If VC leads VD, then K8 counts down. If it lags HD, then K8 counts up.

**VD** *(Trak Ball Vertical Direction )* - Direction output of multiplexer D9 that originates in vertical steering PCB of Trak Ball. See VC description.

**HC** *(Trak Ball Horizontal Clock)* - Clock output multiplexer D9 that originates in the horizontal steering PCB of the Trak Ball, used to clock flip-flop J8 and counter K9. If HC leads HD, then K9 counts down. If it leads HD, then K9 counts up.

**HD** *(Trak Ball Horizontal Direction)* - Direction output of multiplexer D9 that originates in horizontal steering PCB of Trak Ball. See HC description.

**HTBCLKX** *(Horizontal Trak Ball Clock)* - Player 1 or player 2 horizontal Trak Ball clock input to game PCB from horizontal steering PCB of Trak Ball. Player 2 input is used only in a Cocktail game, and game PCB must have -02 or higher Program Memory installed.

**HTBDIRX** *(Horizontal Trak Ball Direction)* - Player 1 or player 2 horizontal Trak Ball direction input to game PCB from horizontal steering PCB of Trak Ball. Player 2 input is used only in a Cocktail game, and game PCB must have -02 or higher Program Memory installed.

**VTB CLKX** *(Vertical Trak Ball Clock)* - Player 1 or player 2 vertical Trak Ball clock input to game PCB from vertical steering PCB of Trak Ball. Player 2 input is used only in Cocktail game, and game PCB must have -02 or higher Program Memory Installed.

**VTB DIRX** *(Vertical Trak Ball Direction)* - Player 1 or player 2 vertical Trak Ball direction input to game PCB from vertical steering PCB of Trak Ball. Player 2 input is used only in Cocktail game, and game PCB must have -02 or higher Program Memory Installed.

**IN0** - Address decode that, when low, enables buffer L9 for data input to the microprocessor of COIN switches, START switches, player 2 FIRE switches (for Cocktail game only), or Trak Ball rate of turn information. If CTRLD is low, data is from switches. If high, Data is Trak Ball information.

TO MICROPROCESSOR UNBUFFERED DATA INPUT




**IN1** - Address decode that, when low, enables buffer M9 for data input to the microprocessor of TEST, SLAM, FIRE switches, and Trak Ball vertical and horizontal rate of turn.

**IN2** - Address decode that, when low, enables buffer P10 for data input to the microprocessor of switch settings of DIP switch R10.

# Memory Map for Address Decoding Circuit, Sheet 1, Side B

| MEMORY MAP | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ADDRESS | | | | | | | | | | | | | | | | | DATA | | | | | | | | | |
| HEXIDECIMAL | A15 | A14 | A13 | A12 | A11 | A10 | A9 | A8 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 | R/W | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | FUNCTION |
| 0000-01FF | 0 | 0 | 0 | 0 | 0 | 0 | A | A | A | A | A | A | A | A | A | A | | D | D | D | D | D | D | D | D | 512 Bytes of Working RAM |
| 0200-05FF | 0 | 0 | 0 | 0 | 0 | A | A | A | A | A | A | A | A | A | A | A | | D | D | D | D | D | D | D | D | 3rd-color-bit region of Screen RAM |
| 0600-063F | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | A | A | A | A | A | A | | D | D | D | D | D | D | D | D | More Working RAM |
| 06F0-3FFF | 0 | 0 | A | A | A | A | A | A | A | A | A | A | A | A | A | A | | D | D | D | D | D | D | D | D | 2-color-bit region of Screen RAM |
| 4000-400F | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | A | A | A | | D | D | D | D | D | D | D | D | POKEY Ports |
| 4800 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | D | | | | | | | | Right Coin Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | D | | | | | | | Center Coin Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | D | | | | | | Left Coin Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | D | | | | | 1-player Start Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | D | | | | 2-player Start Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | | D | | | 2nd-player left Fire Switch Input (Cocktail Only) |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | | | D | | 2nd-player center Fire Switch Input (Cocktail Only) |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | | | | D | 2nd-player right Fire Switch Input (Cocktail Only) |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | D | D | D | D | Horizontal TRAK BALL displacement if CTRLD latched high |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | D | D | D | D | | | | | Vertical TRAK BALL displacement if CTRLD latched high |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | D | | | | | | | Screen Flip |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | D | | | | | | Left Coin Counter Output |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | D | | | | | Center Coin Counter Output |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | | D | | | | Right Coin Counter Output |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | | | D | | | 2-Player Start LED Output |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | | | | D | | 1-Player Start LED Output |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | | | | | D | CTRLD - If low, read Switches. If high, read TRAK BALL |
| 4900 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | D | | | | | | | | VBLANK read |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | D | | | | | | | Self-Test Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | D | | | | | | SLAM Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | D | | | | | Horizontal TRAK BALL Direction Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | D | | | | Vertical TRAK BALL Direction Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | | D | | | 1st-player left Fire Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | | | D | | 1st-player center Fire Switch Input |
| | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | | | | | | | | D | 1st-player right Fire Switch Input |
| 4A00 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R | D | D | D | D | D | D | D | D | Option Switch Inputs |
| 4B00-4B07 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | A | A | A | W | | | | | D | D | D | D | Color RAM |
| 4C00 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | | | | | | Watchdog |
| 4D00 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W | | | | | | | | | Interrupt Acknowledge |
| 5000-7FFF | 0 | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | R | D | D | D | D | D | D | D | D | Program |

**OUT0** - Address decode that, when it goes low, latches microprocessor-buffered data bits DB0 thru DB6 at the output of latch F9.

FROM MICROPROCESSOR BUFFERED DATA

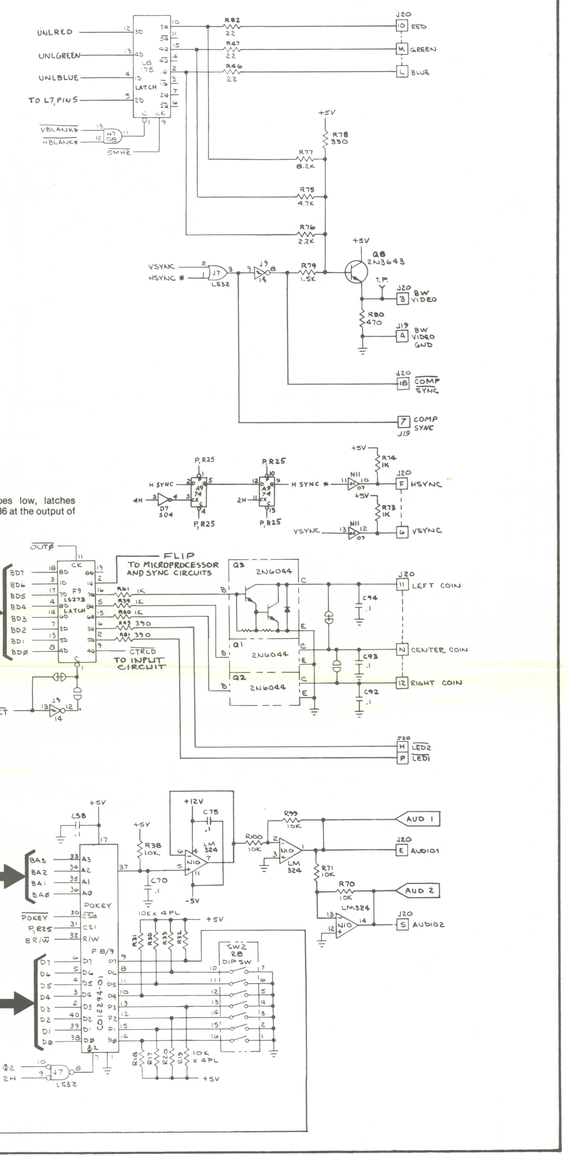
FROM MICROPROCESSOR BUFFERED ADDRESS

**POKEY** *(POKEY chip enable)* - Address decode that, when low, enables custom I/O POKEY chip N/P8/9 for data input or output. The POKEY chip works in conjunction with the microprocessor. It is the input port for DIP switch R8 and the audio output port. BR/W determines the direction of data flow as addressed by BA0 thru BA3.

**BR/W** *(Buffered Read/Write)* - Microprocessor-generated signal that, when high, allows microprocessor to read POKEY input data from DIP switch R8. When low, allows microprocessor to write to POKEY output.

TO/FROM MICROPROCESSOR UNBUFFERED DATA

# Output Circuits

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## Sheet 2, Side B

# MISSILE COMMAND™

## Input and Output Circuitry

## Section of 035467-XX D

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